

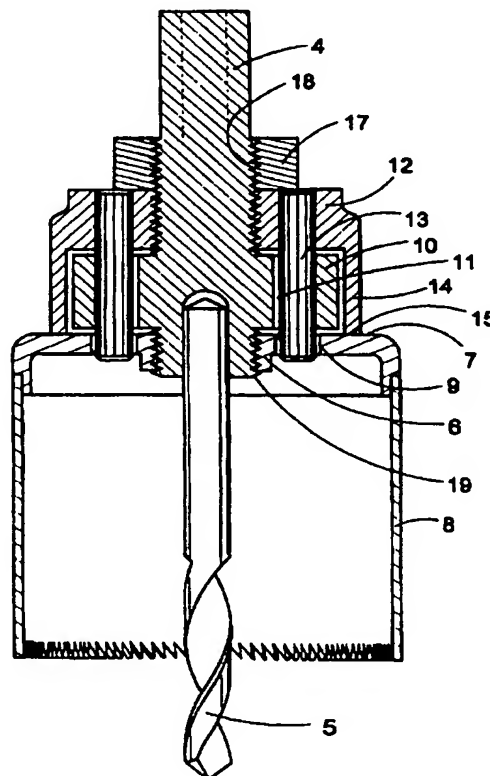
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(21) International Application Number: PCT/SE96/01385 (22) International Filing Date: 28 October 1996 (28.10.96) (30) Priority Data: 9503797-4 27 October 1995 (27.10.95) SE (71) Applicant (for all designated States except US): SANDVIK AB; (publ) [SE/SE]; S-811 81 Sandviken (SE). (72) Inventors; and (75) Inventors/Applicants (for US only): ALM, Sture [SE/SE]; Norra Tornsgatan 12, S-531 30 Lidköping (SE). HOLM, Per [SE/SE]; Vallgatan 25 D, S-531 31 Lidköping (SE). (74) Agent: SUNDSTRÖM, Erik; Sandvik AB, Patent Dept., S-811 81 Sandviken (SE).		(81) Designated States: US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i>

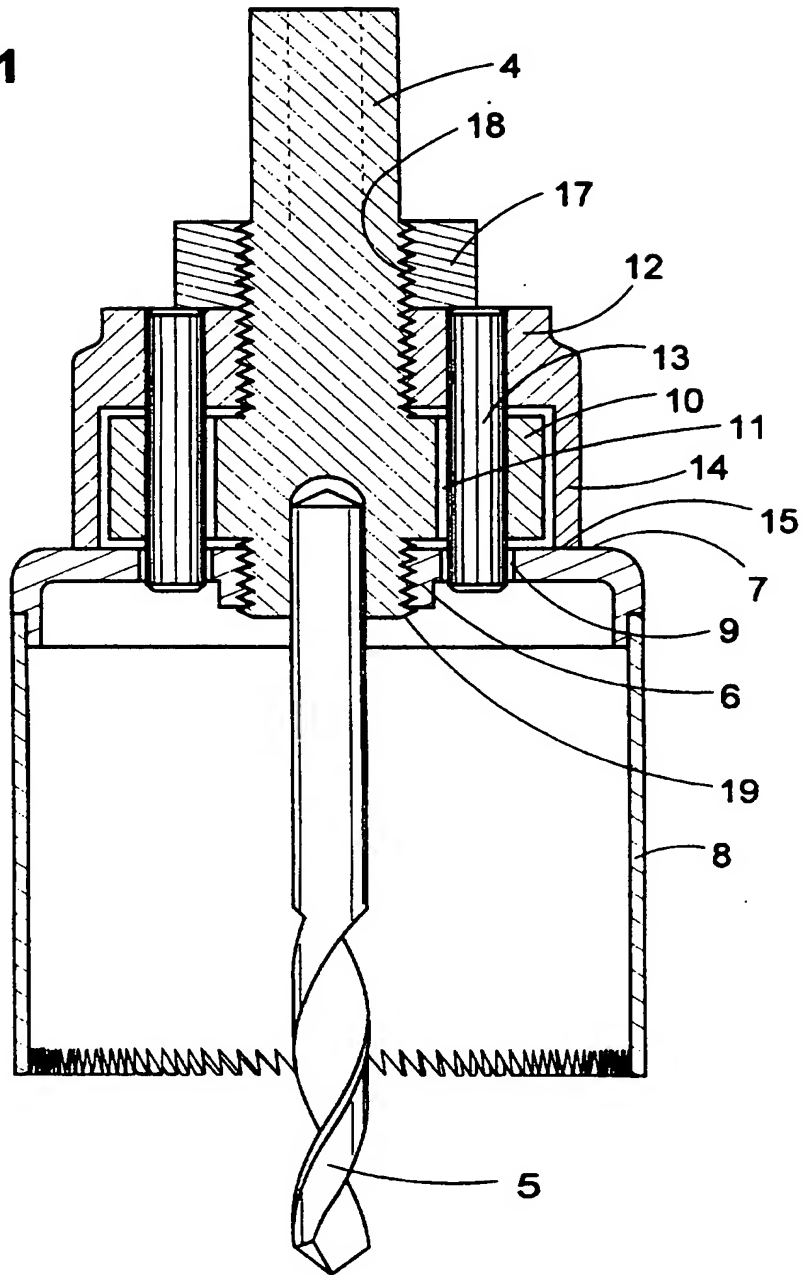
(54) Title: HOLE SAW**(57) Abstract**

Hole saw device comprising an arbor, a cup-shaped hole saw with a center hole and one or more drive apertures, and an axially movable pin carrier constrained to rotate with the arbor provided with drive pins engaging the drive apertures, the pin carrier having a skirt surrounding the drive pins and able to transmit axial force to the hole saw.

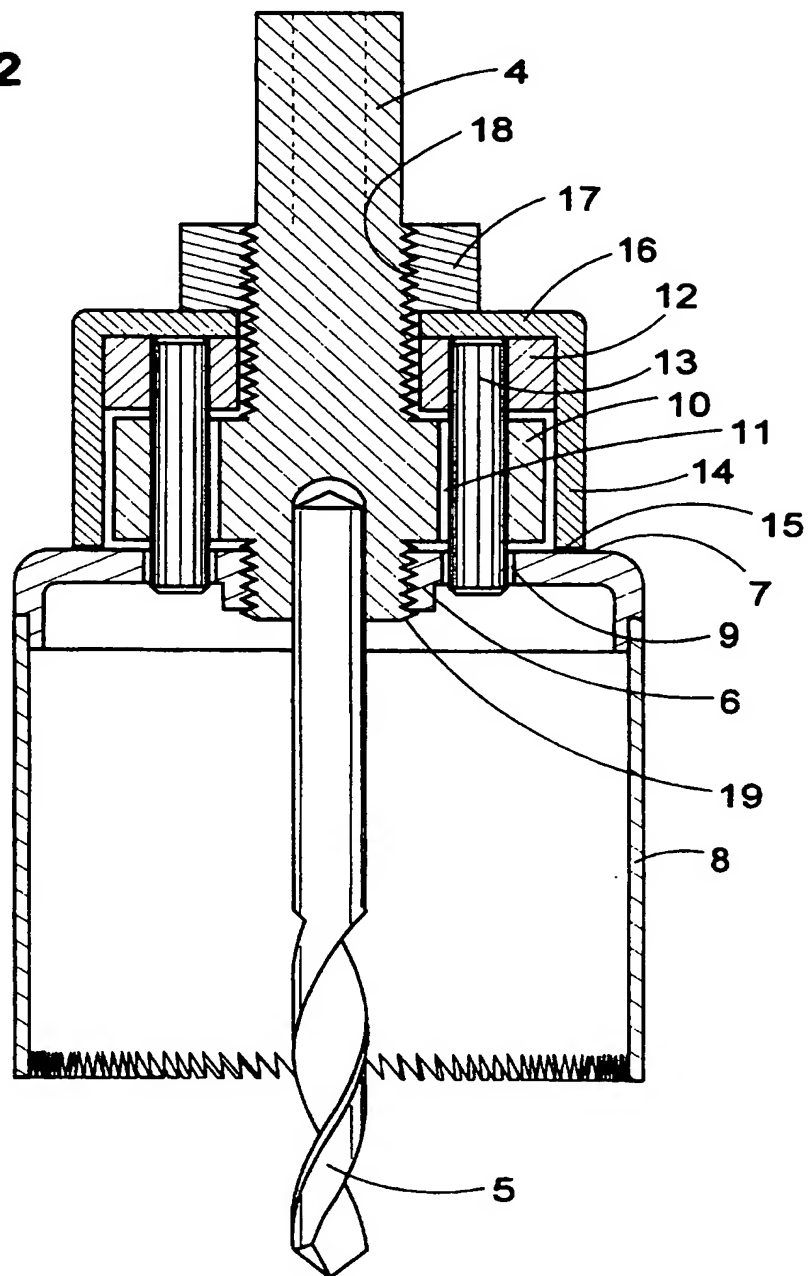


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Fig. 1



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Fig. 2

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HOLE SAW

Background

5 Hole saw devices are used with drill equipment to make round holes of larger diameter than can be made with spiral drills. They require only a limited amount of energy, since only a narrow region has to be turned into chips, and not all of the hole section. Hole saw devices traditionally comprise an arbor with one or more threaded portions, a center drill attached to the arbor, an axially movable pin carrier which is axially movable but constrained to rotate with the arbor and provided with one or more drive pins, and a cup-shaped hole saw screwed onto a 10 threaded portion of the arbor and forced to rotate with the arbor by the drive pins penetrating through drive apertures in a flat part of the hole saw. Such hole saw devices are described in the patents US 4,669,928, US 4,968,189 and others. The pin carrier is commonly constrained to rotate with the arbor by the drive pins extending through guide holes in a flange integral with the arbor, and locked axially by a retaining nut when the drive pins penetrate the drive apertures. 15 Splines or polygonal surfaces may also be used to constrain the carrier.

20 One feature of such hole saw devices is that apart from the rotation with the arbor, the hole saw proper is located axially and in tilting directions solely by the threads of the arbor, since if it were screwed tight against the termination of the threads, the holes of its flat part might not coincide with the drive pins and the guide holes. The threads are prone to wear, and must anyway be rather loose-fitting to simplify changing of hole saws. Consequently, the hole saw will be rather 25 movable relative to the center drill, except as to rotation. If the teeth of the saw are cutting unequally, such as when making a hole near the edge of a workpiece, or when sawing into a sloping or curved surface, the hole saw will vibrate severely, causing noise, uneven hole surface and rapid wear of the threads. Likewise, transmitting the axial force by the threads to the threaded center hole of the hole saw may cause overloading and deformation of the flat part of the hole 30 saw and thus make the vibration even worse.

Description of the invention

35 The invention concerns an improved hole saw device, where the carrier is provided with an annular support area farther from the arbor centerline than the locking pins. Axial forces will be transmitted to the hole saw through the annular support area instead of through the narrow threads, the threads only transmitting a

small pretension load. The hole saw will then be accurately and stiffly located, with no possibility to rattle or vibrate, and the risk of deformation of the hole saw and premature wear of the threads is much reduced. A further advantage is that the thread may be manufactured with a smoother termination to lower the risk of fatigue cracks.

Description with reference to the drawings

Figure 1 shows a section through one embodiment of the invention, figure 2 a section through another.

The hole saw device comprises: an arbor (4) with an upper threaded part (18) and a lower threaded part (19) and an integral flange (10) with guide holes (11); a center drill (5); a hole saw with a toothed cylindrical part (8) and a flat part (7) with drive apertures (9) and an internally threaded center hole (6); an internally threaded nut (17); and a pin carrier (12) with drive pins (13). The novelty according to the invention is that the pin carrier (12) is provided with a cylindrical skirt (14) extending deeper than the flange (10), but not deeper than the pins (13). The skirt (14) may be made integral with the pin carrier (12) as shown in figure 1, or as shown in figure 2 made as a separate cup-shaped piece (14,16) enclosing the pin carrier and may then be free or attached to the nut (17) or the carrier (12).

When a hole saw (8) is to be removed from the arbor (4), the threaded nut (17) is screwed upwards to allow the pin carrier (12) with the drive pins (13) and the skirt (14) to be lifted clear of the apertures (9) in the flat part (7) of the hole saw. The hole saw can then be rotated relative to the arbor until the threaded center hole (6) leaves the lower threaded arbor part (19) and the hole saw is freely removable.

When a new hole saw is to be attached, it can be screwed onto the lower threaded part (19) of the arbor until it is at a close distance from the termination of the threads at the flange (10). The pin carrier (12) is then slid towards the hole saw with the locking pins (13) guided by the guide holes (11). The hole saw is turned until the apertures (9) in its flat part (7) coincide with the guide holes (11) and the pins can penetrate the apertures (9).

The pin carrier can then be slid further down until the annular support area (15) at the lower edge of the skirt (14) touches the flat part (7) of the hole saw. The nut

(17) is then screwed down to apply pressure to the flat part (7) through the skirt (14). As the nut (17) is tightened, the pressure between the internally threaded hole (6) and the lower threaded arbor part (19) is also increased, but since there is no motion in the thread, no wear occurs. Since any axial sawing feed force is transmitted through the skirt (14) with a larger diameter and not through the threads (19) with a smaller diameter, the flat part (7) will be much less stressed and deformed than if the feed force had to be transmitted through the loose-fitting threads (19).

If the pin carrier is constrained to rotate with the arbor by other means than guide holes in a flange, the requirement that the skirt should reach below the flange does not apply. The threaded center hole and the lower arbor thread may be reduced to a bayonet or twist-lock combination. The annular support surface (15) may be made with one or more interruptions to avoid trapping of lubricant or other debris.

As is common practise, the center drill (5) may be exchanged for a smooth guiding peg if the larger diameter hole made by the cylindrical part (8) of the hole saw is to be centered around a previously made smaller hole. The guiding peg may be fastened to the arbor in the same manner as the center drill (5), or screwed onto the lowest part of the arbor thread (19) below the hole saw. In the latter case, a hole saw of the same smaller diameter as the previously made hole may be used as a guiding peg.

CLAIMS

- 5 1. Hole saw device, comprising an arbor (4), a cup-shaped hole saw with flat upper part (7), the flat part having a center hole (6) and one or more drive apertures (9), and a pin carrier (10) constrained to rotate with the arbor (4) but axially movable to let one or more drive pins (13) engage the drive apertures (9), characterized by the pin carrier (10) provided with a skirt (14) surrounding the drive pins (13), the skirt having an annular contact surface (15) which is pressed against the flat part (7) of the hole saw when the drive pins (13) engage the drive apertures (9).
- 10 2. Hole saw device according to claim 1, where the skirt is integral with the pin carrier.
3. Hole saw device according to claim 1, where the skirt is a separate piece enclosing the pin carrier.
- 15 4. Pin carrier for use in a hole saw device, comprising one or more drive pins (13) for engaging drive apertures (9) in a hole saw, and a skirt (14) with an annular contact surface (15) surrounding the drive pins and able to apply axial force to the hole saw after the drive pins have penetrated the drive apertures (9).

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 96/01385

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B23B 51/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B23B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3837759 A (BITTERN), 24 Sept 1974 (24.09.74), figure 1, abstract --	1-4
Y	US 3758221 A (MESHULAM), 11 Sept 1973 (11.09.73), figures 1-3, abstract --	1-4
Y	US 3784316 A (BITTERN), 8 January 1974 (08.01.74), figure 1, abstract --	1-4
A	US 4669928 A (MEDIIVILLA), 2 June 1987 (02.06.87), figures 1-3, abstract --	1-4

☒ Further documents are listed in the continuation of Box C.
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Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3647310 A (MORSE), 7 March 1972 (07.03.72), figures 2,9,17,12, abstract --	1-4
A	US 4148593 A (CLARK), 10 April 1979 (10.04.79), figures 1,2, abstract --	1-4
A	GB 2257381 A (ELDON TOOL COMPANY LIMITED), 13 January 1993 (13.01.93), figure 1, abstract -- -----	1-4

INTERNATIONAL SEARCH REPORT
Information on patent family members

28/10/96

International application No.
PCT/SE 96/01385

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 3837759	24/09/74	NONE	
US-A- 3758221	11/09/73	GB-A- 1404350	28/08/75
US-A- 3784316	08/01/74	NONE	
US-A- 4669928	02/06/87	NONE	
US-A- 3647310	07/03/72	NONE	
US-A- 4148593	10/04/79	CA-A- 1077807	20/05/80
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		GB-A,B- 2013115	08/08/79
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GB-A- 2257381	13/01/93	NONE	